

Discovering Africa through Internet-based Geographic Information Systems: A Pan-African Summit Simulation

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The people of Africa continue to experience significant turmoil: genocide in Sudan; violence against children in Congo; piracy off the coast of Somalia; and disease, hunger, debt, conflict, and corruption throughout much of the continent. The challenges facing post-colonial Africa have been the basis for numerous international relief efforts for decades. The Organization of African Unity (OAU) was created in an early effort to develop Africa as countries gained independence. Formed in 1963, the OAU became known as the “Dictator’s Club” because, despite the rhetoric of unity, the African leaders upheld a non-interventionist policy that became a justification for ignoring the political and human rights abuses of neighboring states.

In 2002, the OAU was officially replaced by the African Union (AU). The goals of the AU include promoting democracy, human rights, and development across the African continent. The AU is composed of a set of organs, including a Pan-African Parliament and a Court of Justice. The parliament and common court are intended to provide a stronger voice for the people of Africa as the nations attempt to create a Pan-African economy and hold leaders accountable for human rights abuses. Since its founding, the AU has held numerous summits and conferences to focus attention on the many critical issues facing the continent.¹

A Discovery Learning Framework

In the United States, we get very little news about Africa, and what news we do get is about war or famine, with little historical information or context. In order to give our approximately 100, ninth-

grade students (in five World Geography classes) a more profound knowledge of this vast continent, we developed and implemented a project to simulate a Pan-African Summit (See page 145).² One primary goal for this project was to have students essentially *discover* Africa on their own by examining the human and physical conditions of various regions of the continent and then drawing tentative conclusions about the nature of the problems afflicting African countries. We decided to use discovery learning as a guiding framework for this project. Jerome Bruner, an early advocate of discovery learning, explained the principles of the approach in his 1960 book, *The Process of Education*.³

Mastery of the fundamental ideas of a field involves not only the grasping of general principles, but also the development of an attitude toward learning and inquiry, toward guessing and hunches, toward the possibility

of solving problems on one’s own. ... To instill such attitudes by teaching requires something more than the mere presentation of fundamental ideas ... it would seem that an important ingredient is a sense of excitement about discovery—discovery of regularities of previously unrecognized relations and similarities between ideas, with a resulting sense of self-confidence in one’s abilities. (p.20)

Through discovery learning, students use inductive reasoning to sort through examples and details in order to develop an understanding of general principles. For example, instead of telling students that many economic indicators tend to be interrelated, we wanted students to discover these connections on their own. They might note, for example, that the countries with low per capita GDP also tend to have high infant mortality rates, low life expectancies, and high incidence of environmental, educational, and health related problems. And as they explore the relationships between humans and their physical environment, students begin to recognize the complexity and interrelatedness of the problems facing African countries. Through the discovery learning approach, we hoped that students would come to realize that the sources of poverty, hunger, disease,

and conflict are numerous, interrelated, and not easily remedied.

Examining Geographic Information

Prior to beginning this project, the students in our World Geography classes had completed a unit on Europe. We began the study of Africa by comparing standard of living indicators in Europe with those in Africa. We projected on the wall thematic maps showing Europe and Africa. The maps displayed included birth and death rates, GDP per capita, infant mortality rate, life expectancy, literacy rate, and the percentage of the population over 60 years old. As a class, we discussed the meaning of each indicator and the patterns that were revealed on each map. Students were able to recognize the vast differences between Europe and Africa, and the more advanced students hypothesized about the relationships between the various indicators. This introductory lesson served as a review of the standard of living indicators and thematic map analysis. Furthermore, it provided some perspective for the students when comparing countries of differing levels of development.

Following the introductory lesson, the students in each class were divided into five groups representing the northern, central, southern, eastern, and western regions of Africa.⁴ The task for each group was to prepare to represent their region at an upcoming Pan-African summit. Each group was directed to collect relevant data about the countries of their region, to identify what they believed to be the most significant issue facing their region, and to create a PowerPoint® presentation for the summit that argued persuasively in favor of devoting resources to this issue. Students were encouraged to incorporate Internet-based maps, charts, images, and tables to support their position. The groups also were required to develop a formal proposal on addressing the issue that they had selected. Each group received three data tables titled *Human Features*, *Physical Features*, and *Economic Features*.⁵ The data tables consisted of the country names

as rows and several attributes as columns (See Appendix A). Each group was given data tables that were missing data in 10 cells. The first step for each group was to locate the missing data. We directed the students to the U.S. Central Intelligence Agency (CIA) World Factbook (<https://www.cia.gov/cia/publications/factbook/index.html>) website to complete this task. The CIA World Factbook contains a wealth of information for each country of the world in an easily accessible format. We provided the students with mostly complete data tables because, while we wanted them to become familiar with data collection and tabulation, we preferred that they spend the majority of their time analyzing the data to identify trends and patterns.

Students worked in groups for six class periods (about 45 minutes each) to prepare their presentations. The school is equipped with two mobile laptop carts that provide wireless access to the Internet in the regular classroom. Each group of four to five students had three to four laptops at their station. While some groups were able to identify an issue by reviewing their data charts, other groups needed to do additional exploration. We provided the groups with a list of websites containing information relevant to the project (on page 145). Most students tended to gravitate toward popular websites such as PBS, CNN, and National Geographic. Perhaps the most beneficial website, though, was Globalis; an Internet-based Geographic Information Systems (IGIS) website.

Internet-based Geographic Information Systems

Recent advancements in Geographic Information Systems (GIS) technologies have made it possible to provide interactive maps and geographic data over the Internet. These Internet-based Geographic Information Systems (IGIS) websites provide an interface that allows users to search for particular locations and then to interact with the map using tools such as pan, zoom, and identify. Additionally, a user can add new layers to the map such as an aerial photograph

or labels.⁶ The general public frequently uses IGIS websites such as Google Maps (maps.google.com) or MapQuest (www.mapquest.com) to get directions to and from specified locations. More advanced sites provide a variety of data layers so that users may create custom maps and explore geographic data in map and graph format. More advanced IGIS websites include the National Atlas (www.nationalatlas.gov), National Geographic Society's MapMachine (plasma.nationalgeographic.com/mapmachine/index), the U.S. Census Bureau American Factfinder (factfinder.census.gov), the USGS National Map (nmviewogc.cr.usgs.gov/viewer.htm), and Globalis (globalis.gvu.unu.edu).

The Globalis website was an excellent source for the students completing this project.⁷ The Globalis interface is divided into frames that include a map in the center, check boxes and drop-down menus to the left, a description of the data source across the bottom of the screen, and a legend in the right-hand panel. As with most IGIS, Globalis includes common tools such as zoom, identify, save, print, and email. One unique feature of Globalis is that it enables the user to view data as an interactive bar graph. This feature is particularly useful for viewing changes in the data related to one country over time or for comparing countries in a ranked list. For this project, students used Globalis to visualize the data they collected from the CIA website before each group selected its chosen problem. The students found the website easy to navigate, and were intrigued by the ability to view data in interactive map and graph formats. Emerging IGIS environments, such as Globalis, allow students to discover meaning from geographic information, as they visualize data in various formats, make hypotheses about what they are seeing, test their thinking by exploring additional evidence, and ultimately draw connections that they can formulate into generalizations about the topic.

The Pan-African Summit

The teams of students selected a variety of topics for their presentations. These

included issues such as the pandemic of HIV/AIDS, epidemics of malaria and polio, prolonged drought and environmental degradation, widespread famine and lack of nourishment, ongoing wars and violence, and the absence of gender equality and democracy. Each team gave a PowerPoint® presentation that included at least six slides: the name of the country or region, an overview map, a brief explanation of the significant issue, a map of the issue, a photo or graph of the issue, and a proposal to the African Union for addressing this issue. Most teams used Globalis to create maps and graphs that they saved and imported into their PowerPoint® presentations (See Appendix B).⁸

Many of the teams found it difficult to develop a proposal for addressing their selected issues. We expected this portion of the project to be challenging, but we believe that it offered an opportunity for students to engage in creative thinking. Furthermore, it revealed the degree to which each group wrestled with the complexity of these issues. The proposals typically involved action such as increased foreign aid, reallocation of resources, and military intervention. For example, one team focused on the issue of HIV/AIDS prevalence in Southern Africa. They proposed increased foreign aid in the form of an “adopt-a-country” program and a scholarship program. This team argued that

The solution to the HIV/AIDS spreading epidemic isn't just a nationwide effort but a worldwide struggle to help the millions of people whose lives have been affected by the disease. The mission assigned to the world is to “adopt a country.” Each willing country should adopt a country in Southern Africa and open schools to educate the children in academics as well as the prevention of AIDS to help fight and prevent further lives from being lost to this terrible disease. The United States and the UN should fund scholarships for college students

who are interested in medical or teaching degrees. For a complete scholarship of their choice if they spend at least four years in Africa helping to educate the people.

Another team investigated the prevalence of famine in Eastern Africa and proposed a reallocation of resources away from the military. This team stated that “As of 2005, Eastern Africa has used roughly over one billion dollars for military preparation and action. These wars are caused by civil and religious differences. This money can be used towards the undernourished people. It can help feed over 75 million natives.” The team proposed the following course of action:

First, our countries need to create peace with each other. War between our countries does not establish anything but more body counts and less money in our countries' wallets. Second, we need to use the money (used for military reasons) towards the development of these countries. The money can be used towards building a stronger infrastructure. More roads, schools, power systems, and phone lines can benefit the nations. Third, gradually rebuild the economy. Africa has the potential, with all the natural resources, to make it stronger.

Finally, the proposal from a team assigned to Northern Africa was the military interventionist strategy. This team presented data on the lack of democratic governments in Northern African countries and proposed the following:

Our solution to the political problems in Northern Africa is to liberate the dictator-controlled countries of their ineffective and more harmful-than-helpful governments. In doing so, we will send in U.S. forces to try to free the people from the strong grasp of the dictators. We would educate the people on the finer points of a democracy. And through the help of the UN and other nations, we would help

them set up a foundation for a better government.

This proposed solution generated some heated debate within the class about the effectiveness of military solutions. Some students argued that the war in Iraq was evidence that this proposal would not work. The team countered that the situation in African countries is different and that military action was the best course.


Conclusion

We found the results of our initial experience with discovery learning through IGIS to be more positive for the academically advanced students than for those students who typically struggle academically. We observed that the academically advanced students were very motivated by this form of instruction. They were much more willing than usual to seek out details to back up their assertions, when they could express them visually. They thrived on the opportunity to create their own maps and charts, and were more eager to be analytical than when engaged in written assignments. They commented that they enjoyed being freed from the textbook. Most of all, they relished the freedom to explore a topic of their own choosing and to defend their ideas to their classmates.

In contrast, the below average students struggled somewhat with the process of discovery learning and the complexity of the data and issues. They tended to need prompting to choose a chart or graph that would illustrate a point, and were less likely to draw connections between various indicators on their own. We anticipated the difficulty that some of the below average students would experience. To compensate, we modified the assignment in one class that held numerous below average students. These students were directed to select one country from their region as the focus for their project. We also provided frequent personal attention to these students to assist them as they considered the data and made decisions.

This project represents an early adoption of emerging IGIS websites, such

as Globalis, paired with a discovery learning framework to facilitate student understanding of geographic phenomena. Despite the reality of significantly different ability levels among these students, we believe that all of the students were successful in *discovering* Africa through this IGIS-based project. All of our students explored a variety of economic indicators and geographic attributes. They compared and contrasted the data across countries, regions, and continents to identify trends. They recognized how these geographic data can serve to illustrate human development issues. With the aid of an IGIS, they constructed maps and graphs of their data sources to support their assertions regarding the significance of issues facing the people of their regions. As students struggled with developing a proposal for addressing their chosen issue, they came to recognize the complexity of geographic phenomena. Finally, they simulated a Pan-African summit in order to report their findings publicly and to educate their classmates about the issues evi-

dent in various regions of the African continent. Based on our experience, we encourage other social studies and geography teachers to explore uses for IGIS with their students as a means for discovering the world.⁹ 

Notes

1. For more information on the African Union, see www.africa-union.org.
2. Three of the classes were Pre-Advanced Placement Human Geography and two were World Geography Studies.
3. Jerome Bruner, *The Process of Education* (Cambridge, Mass.: Harvard University Press, 1960).
4. The small island nations of Comoros, Seychelles, Sao Tome & Principe, Mauritius, and Cape Verde were excluded for the sake of simplifying the data collection and focusing on the continental African countries.
5. The human attribute data included population, median age, population growth rate, HIV/AIDS adult prevalence rate, life expectancy at birth, religions, languages, and literacy rate. The economic features included GDP purchasing power parity, agricultural products, industries, electricity consumption, and oil consumption for each country. The physical features included area (km²), climate, terrain, natural resources, and natural hazards.
6. See Thomas R. Baker, "Internet-based GIS Mapping in Support of K-12 Education," *The Professional Geographer*, 57, no. 1, (2005): 44-50; and Andrew J. Milson, "Local Data, Global Concepts: GIS Internet Mapping," *The Geography Teacher* 3, no. 1, (2006): 14-16.

7. Globalis was developed through a partnership among the Norwegian United Nations Association, the UN Environmental Program's GRID Centre at Arendal, the UN Global Virtual University, and other Norwegian agencies and educational institutions.
8. The groups accomplished this by creating the map or graph using Globalis, copying the image into Microsoft Paint for cropping, saving the new image, and then inserting it into the desired PowerPoint slide.
9. The authors wish to express their gratitude to Micki Blume, Marci Smith Deal, and Sherilynn Cotten for their support of this project.

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Digital Age: Technology-Based K-12 Lesson Plans for Social Studies

Linda Bennett and Michael J. Berson, editors
NCSS Bulletin No. 105, 200 pp, 2007

Exemplary K-12 social studies lessons that infuse technology are the focus of this bulletin. At least one of the authors is a classroom teacher in the majority of the lessons presented. The lessons are based on the NCSS standards. The elementary lessons in this book focus on history, economics, geography, civics, and global studies. Each lesson includes links with NETS-S (National Educational Technology Standards) and suggests technology applications appropriate for the grade level. In addition, the bulletin includes a section on tools and techniques concerning classroom management, Internet safety, software, images, and podcasting.

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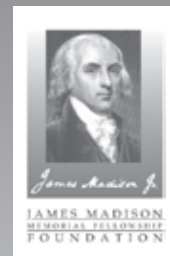
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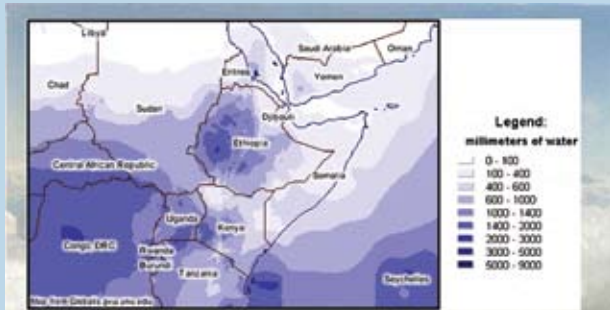
Appendix A. Sample Rows from Data Collection Charts

PHYSICAL FEATURES					
Country	Area	Climate	Terrain	Natural Resources	Natural Hazards
Mauritania	1,030,700 sq km	desert; constantly hot, dry, dusty	mostly barren, flat plains of the Sahara; some central hills	iron ore, gypsum, copper, phosphate, diamonds, gold, oil, fish	hot, dry, dust/sand-laden sirocco wind blows primarily in March and April; periodic droughts

HUMAN FEATURES								
Country	Population	Median Age	Population Growth Rate	HIV/AIDS Adult Prevalence Rate	Life Expectancy at Birth (Total)	Religions	Languages	Literacy Rate
Mauritania	3,086,859 (July 2005 est.)	16.98 years	2.9% (2005 est.)	0.6% (2003 est.)	52.73	Muslim 100%	Arabic (official), Pulaar, Soninke, French, Hassaniya, Wolof	41.7%

ECONOMIC FEATURES					
Country	GDP (Purchasing Power Parity)	Agricultural Products	Industries	Electricity Consumption	Oil Consumption
Mauritania	\$6.185 billion (2005 est.)	dates, millet, sorghum, rice, corn, cattle, sheep	fish processing, mining of iron ore and gypsum	172.6 million kWh (2003)	24,000 bbl/day (2003 est.)

Appendix B. Sample Student Work: Selected PowerPoint Slides



One of the largest problems in East Africa has been drought. Some East African countries have been without rain for at least 2 or 3 years. The lack of precipitation has caused numerous other problems that have affected the quality of life among East African people.



Appendix C. Student Instructions for Pre-AP Geography

Congratulations! You have been elected to represent your region of Africa at the upcoming Pan-African Summit. The summit is being held by the African Union (AU). The AU was officially established in 2002 with the goals of promoting democracy, human rights, and development across the African continent. The membership of the AU consists of 53 of the 54 countries in Africa. (Morocco refuses to join the AU because Western Sahara is a member.)

What you need to do

1. Your TEAM will represent one of the following regions of Africa and the countries within that region:

- **Northern:** Western Sahara, Morocco, Algeria, Tunisia, Libya, Egypt
- **Central:** Chad, Nigeria, Cameroon, Central African Republic, Equatorial Guinea, Gabon, Republic of the Congo, Democratic Republic of the Congo
- **Southern:** South Africa, Lesotho, Swaziland, Namibia, Botswana, Zimbabwe, Mozambique, Angola, Zambia, Malawi
- **Eastern:** Sudan, Eritrea, Djibouti, Ethiopia, Uganda, Kenya, Somalia, Rwanda, Burundi, Tanzania, Madagascar
- **Western:** Mauritania, Senegal, Gambia, Guinea-Bissau, Guinea, Sierra Leone, Liberia, Cote d'Ivoire, Ghana, Togo, Benin, Burkina Faso, Mali, Niger

2. Your TEAM will collect data about the features of this region. You will record what you find on three data collection charts:

- Human Features
- Physical Features
- Economic Features

The United States government has given you access to information about the countries in your region. You can access the information needed to complete your data collection charts through the Central Intelligence Agency (CIA) at the CIA World Factbook website: www.cia.gov/cia/publications/factbook

3. After your team has collected all of the data, review your charts. Are there any patterns that you see in the information about these countries? What are some of the most significant problems that the countries in your region face? Your team is responsible for determining which issue or problem is most significant for your region. What problem in your region should the AU (and the rest of the world) devote its attention and resources to addressing?

4. Once your team has identified the most significant issue that your region faces, do some additional research on some of the following websites to collect additional facts and data to support your case for additional attention and resources.

Public Broadcasting Service: www.pbs.org/wnet/africa

AllAfrica.com: allafrica.com

Univ of Pennsylvania African Studies Center: www.sas.upenn.edu/African_Studies/Home_Page/WWW_Links.html

African Union: www.africa-union.org

United Nations Economic Commission for Africa: www.uneca.org

The World Bank: www.worldbank.org

World Health Organization: www.afro.who.int

Human Rights Watch: hrw.org/doc/?t=africa

TIME magazine: www.time.com/time/2001/aidsinafrica

BBC News: news.bbc.co.uk/1/hi/world/africa/default.stm

Africa Daily: www.africadaily.com

The New York Times: www.nytimes.com/pages/world/africa

CNN: www.cnn.com/WORLD/africa/archive

Global Issues: www.globalissues.org

National Geographic: www.nationalgeographic.com/africa

5. Use the Globalis website (globalis.gvu.unu.edu) and/or Google Earth, to explore the data for Africa. Create at least one map and one graph that display important information about your region and the issue your team has selected.

6. Your team will prepare a PowerPoint presentation to be presented at the summit that will convince the audience of the importance of the issue your team selected. Your presentation must include at least the following elements:

- An overview map of your region
- A map and a graph that displays data related to this issue
- A rationale for selecting this issue
- A proposal for action to address this issue